

REMARKS

Amendments to the Claims

Claims 1 and 3-11 are under examination with entry of the present Amendment. Claims 1 and 3-10 have been amended. Claim 11 has been cancelled. Claim 12 is newly added.

Claims 1 and 3-10 have been amended to be directed specifically to a solid oxide fuel cell stack comprising a plurality of adjoining fuel cells, wherein the fuel cells are mutually sealed in a gas-tight manner by a seal formed of the recited elements. Support resides in the as-filed specification for example, in paragraph [0009], which states that the gas seal is provided to seal solid oxide fuel cells from adjoining cells within a SOFC stack, and to seal the input gases from each other while moving through the stack.

New claim 12 recites a composition for forming a gas seal against adjoining fuel cells in a solid oxide fuel cell stack comprising ceramic fibres, ceramic powder, a plasticizer, an organic binder, a dispersant, and a solvent. Support resides in the as-filed specification for example, in paragraph [0037], which describes a slurry created with the recited ingredients in particular proportions to form the gas seal for the SOFC stack.

No new matter has been added with the amendments made herein. Support for the amended and new claims is found throughout the application and in the as-filed claims. Applicants believe that the amended and new claims better define the invention in a manner supported by the original application, and in a manner so as to render moot the rejections as set out below.

Rejections under 35 U.S.C. §112

Claims 1 and 11 are rejected for failing to comply with the written description requirement. The Office Action alleges that the specification does not reasonably provide sufficient description of "ceramic-to-ceramic contact" (claim 1) or "uncoated material" (claim 11).

In the interest of advancing prosecution but without acquiescing to this rejection, Applicants have amended claim 1 to delete the objected language, and cancelled claim 11. In view of Applicants' amendments, this rejection is considered moot.

Rejections under 35 U.S.C. §102(b) and 103(a)

Claims 1 and 3-11 are rejected under U.S.C. §102(b) as anticipated by, or in the alternative, under 35 U.S.C. §103(a) as obvious over US Patent No. 4,933,309 to Luthra for the reasons set out on pages 3-7 of the Office Action.

Applicants respectfully traverse this rejection. For prior art to be anticipatory, every element of the claimed invention must be disclosed in a single item of prior art in the form literally defined in the claim. As noted above, Applicants have cancelled claim 11 and amended claims 1 and 3-10 for clarity to be drawn to a solid oxide fuel cell stack comprising a plurality of adjoining fuel cells. It is an element of claims 1 and 3-10, as amended, that the fuel cells of the claimed SOFC stack are mutually sealed in a gas-tight manner by a seal formed of the recited elements. Luthra does not teach or suggest a SOFC stack comprising the recited seal. As such, the requirement for anticipation has not been met with respect to the amended claims of the present application. Amended claims 1 and 3-10 thus include language which better distinguishes from the teachings of Luthra.

The technical problem solved by Applicants' invention is to provide a flexible seal for use in a SOFC stack which is impervious to fuel cell stack gases to minimize their leakage for efficiency and safety reasons, and exhibits superior interface performance with the fuel cell and the interconnect. Further, the seal should be resistant to thermal cycling degradation and long term degradation. It is well known that it is difficult to produce seals with desired porosities by dipping and impregnation. The solution is achieved by providing a seal formed from a tape casting method and having an increased post-fired porosity compared to its pre-fired porosity. The seal remains unsintered to ensure flexibility and to prevent degradation that typically results from thermal expansion or contraction.

One skilled in the art will recognize that porosity is an undesirable property for a seal for use in a SOFC stack. However, Applicants' claimed seal having a reasonable level of porosity is an

unexpected result. One skilled in the art having common sense at the time of the invention would not have reasonably considered or expected that a seal having a porosity of 35-60% would be operative in a high temperature fuel cell. This solution has considerable technical effects, since seals formed in this manner are less porous and denser than seals created by dipping and impregnation.

As can be seen in Figure 3, the porosity of the dip-impregnated seal is greater than that of the tape cast seal which exhibits more uniform porosity. As described in Example 1, the dip-impregnated seal has a porosity higher than about 60%. Leak rate test results indicate that dip-impregnated seals are prone to gas leakage due to the large macroporosity (Figure 4, Example 5) compared to tape cast seals which do not experience this problem (Figure 5, Examples 2, 4 and 5). The data in Table 4 indicate pre-fired porosities for trial seals between about 28% to 45%. The post-fired porosities increased in all trials to between about 36% to 49%. Concomitantly, the post-fired densities were lower than the pre-fired densities. As can be seen in Figure 5, the leakage rates were less than 0.10 ml/min/inch through the range of compressive force. Further, the leakage rates of trial seals #4 were consistently low throughout thermal cycling.

Luthra teaches a densified composite which preferably has little or no porosity (col. 6, line 26). It's intended use as a high temperature structural component indicates it is a rigid, inflexible material, valued for its strength. This material would be a very poor choice for the compressive dynamic seal of the present invention.

Luthra does not teach, suggest or disclose a SOFC stack comprising the recited seal, as required for a *prima facie* rejection under 35 USC §103(a). For a reference to render a claim obvious, it must include the features of the claimed invention. Nowhere can such teaching, suggestion, or prediction be found in Luthra. In view of the foregoing, reconsideration and withdrawal of this rejection are respectfully requested.

CONCLUSION

In view of the foregoing remarks and amendments, it is respectfully submitted that this application is in condition for allowance and allowance thereof is respectfully requested.

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